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Sequence Stratigraphy and Reservoir Characterisation of Permian fluvial-lacustrine successions, Baryulah area, southwest Queensland, Australia

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Abstract

Gas exploration and reservoir development in the Baryulah area, Cooper Basin, southwest Queensland has focused on the Permian coal-bearing fluvial-lacustrine Patchawarra Formation, Murteree Shale, Epsilon and Toolachee Formations. The application of non-marine sequence stratigraphic concepts to wireline-log data, calibrated by available cores enabled the sub-division of litho-stratigraphic Formations into 17 chronostratigraphic intervals or time-rock units spanning a period of 35 million years.

This chronostratigraphic framework, from which log-motif based facies maps were constructed for systems tracts or combinations of systems tracts, is paramount to the preparation of geologically meaningful maps that depict changes of depositional style with time and space. Empirical data (eg. channel sandbody width, channel belt width) and spatial relationship information from appropriate modern and ancient depositional analogues were applied to chronostratigraphic intervals to assist facies mapping. Of particular conceptual value as analogues were the Siberian peatlands and fluvial systems. The following depositional facies were identified in the Baryulah area; fluvial channel, crevasse distributary channel, crevasse splay, overbank/floodplain, floodbasin, peat mire and lacustrine delta.

The facies maps were constructed partly in combination with available 3D seismic attribute maps, enabling suspected depositional morphologies (ie. meander belts, ox bow lakes) to be tested against the depositional interpretation for a specific interval.

Specific intervals, generally lowstand systems tracts of the Patchawarra Formation 'VC40-Vu38' & 'Vu38-VC35', and Toolachee Formation 'basal PC50-PC40', are the highest priority for targeting development wells because of the high net/gross and good reservoir facies (notwithstanding diagenesis). Some of the transgressive systems tract intervals; Patchawarra Formation 'VC35-VC30' & 'VC20-VC00' and Toolachee Formation 'Daralingie Unconformity-PC60' & 'top PC50-PC40', may be good stratigraphic trap candidates, especially if combined with a structural component. The relatively thin but extensive amalgamated lacustrine mouthbar sandstones of the Patchawarra Formation 'VC30-VC20' and the Epsilon Formation 'Tu95-TC80', 'TC80-TC50' & 'TC50-Daralingie Unconformity' represent potentially significant reservoir intervals.

Statement of Authenticity

The work contained in this thesis has not been previously submitted for a degree or diploma at any other higher education institution. To the best of my knowledge, this thesis contains no material previously published or written by another person except where due reference is made.

I give consent to this copy of my thesis, when deposited in the University Library, being available for loan and photocopying.

NATHAN CEGLAR

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